Top Productivity Dynamics in Canada

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TFP Process

- Common assumption for modelling TFP is a Markov process
- AR(1) with $N(\mu, \sigma^2)$ shocks
- Does this adequately characterize the TFP process?
- Not much is known about heterogeneity of the process, especially for top TFP firms
- Could there be important statistical properties that vary over the TFP distribution?
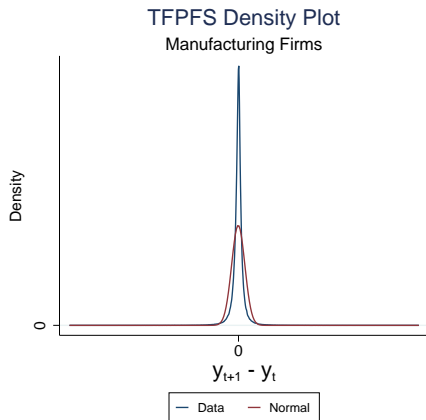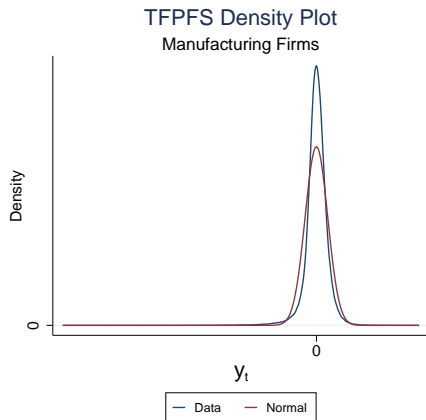
Research Idea

- Conduct nonparametric analysis of TFP dynamics, focusing on the top percentiles
- Specifically, utilize recently developed techniques from the earnings and earnings shocks literature: Guvenen et al. (2015) & Debacker et al. (2013) etc.
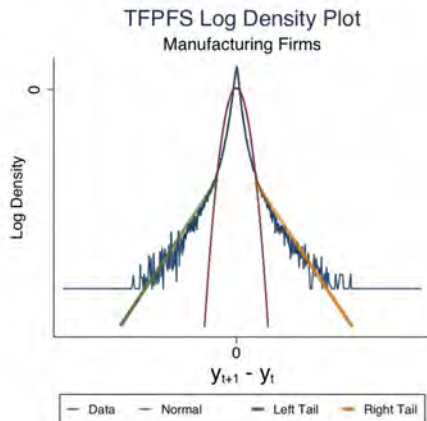
Methods

- Estimate TFP: LP, FS, OLS, FE, Wooldridge (2009), Gandhi, Navarro & Rivers (2016) and Collard-Wexler & De Loecker (2016)
- T2-LEAP & CIP, 2000-2012
- This presentation: Factor share productivity (TFPFS), manufacturing firms

TFP Density Plots

TFPFS Density Plot
Manufacturing Firms

Density

y_t

— Data — Normal

TFPFS Density Plot
Manufacturing Firms

Density

$y_{t+1} - y_t$

— Data — Normal

- Very high kurtosis, long tails

TFP Log Density Plots

- Fat left and right Pareto tails
- Deviations from normality

One Year TFP Transition Matrix

	0%-10%	10%-25%	25%-50%	50%-75%	75%-90%	90%-95%	95%-99%	99%-100%
0%-10%	**0.52**	0.25	0.13	0.06	0.03	0.01	0.01	0.00
10%-25%	0.18	**0.45**	0.27	0.07	0.02	0.00	0.00	0.00
25%-50%	0.06	0.18	**0.52**	0.21	0.03	0.01	0.00	0.00
50%-75%	0.02	0.05	0.22	**0.53**	0.16	0.02	0.01	0.00
75%-90%	0.02	0.02	0.06	0.26	**0.49**	0.11	0.03	0.00
90%-95%	0.01	0.01	0.03	0.10	0.32	**0.34**	0.16	0.01
95%-99%	0.02	0.01	0.02	0.06	0.13	0.21	**0.49**	0.07
99%-100%	0.03	0.01	0.02	0.04	0.06	0.06	0.30	**0.49**

- High persistence, especially for top TFP firms

Five Year − (One Year)^5 TFP Transition Matrix

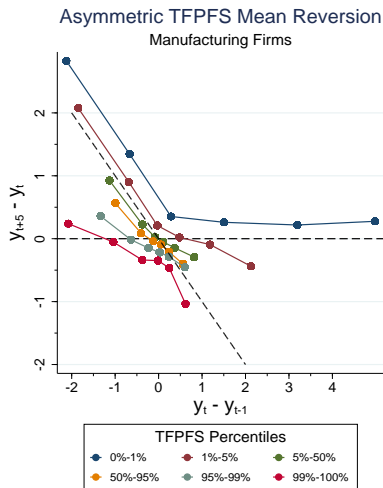|	0%-10%	10%-25%	25%-50%	50%-75%	75%-90%	90%-95%	95%-99%	99%-100%
0%-10%	**0.14**	0.05	-0.06	-0.07	-0.04	-0.01	-0.00	0.00
10%-25%	0.04	**0.11**	0.01	-0.08	-0.06	-0.02	-0.01	-0.00
25%-50%	-0.02	0.02	**0.08**	-0.01	-0.05	-0.02	-0.01	-0.00
50%-75%	-0.03	-0.04	-0.01	**0.09**	0.03	-0.01	-0.01	-0.00
75%-90%	-0.03	-0.06	-0.08	0.01	**0.11**	0.04	0.01	-0.00
90%-95%	-0.02	-0.05	-0.09	-0.06	0.07	**0.08**	0.07	-0.00
95%-99%	-0.02	-0.05	-0.09	-0.08	-0.01	0.06	**0.15**	0.04
99%-100%	-0.00	-0.04	-0.10	-0.11	-0.05	-0.01	0.10	**0.21**

- Persistence effects larger than implied by a Markov process, especially for top TFP firms

TFP Shocks by TFP Level

				Shocks			
Level	Mean	SD	P1	P5	P50	P95	P99
0%-1%	1.56	1.35	-2.16	-0.49	1.48	3.84	5.50
1%-5%	0.32	0.73	-2.09	-0.90	0.36	1.33	1.87
5%-50%	0.00	0.32	-1.14	-0.42	0.02	0.41	0.75
50%-95%	-0.06	0.26	-0.95	-0.44	-0.03	0.25	0.52
95%-99%	-0.16	0.39	-1.51	-0.77	-0.10	0.26	0.55
99%-100%	-0.35	0.61	–2.80	-1.45	-0.21	0.27	0.76

- Mean reversion, shock distribution differs by level

Asymmetric TFP Mean Reversion

Asymmetric TFPFS Mean Reversion
Manufacturing Firms

- Asymmetries between positive and negative shocks across the TFP distribution

Summary

- Deviations from normality with Pareto-like fat tails for TFP and TFP shocks
- Persistence in TFP with deviations from a Markov process
- Heterogeneity of TFP shocks across the TFP distribution with asymmetric mean reversion

- Suggests TFP may not be well specified by a simple Markov process, especially for top TFP firms
- Does this have consequences for modelling, for example, firm heterogeneity models where AR(1) is commonly assumed?

Thank you